APPENDIX A

Final Technical Memorandum
Geotechnical Evaluation

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GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

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To: John Giaudrone Garry Struthers Associates

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TECHNICAL MEMORANDUM

Geotechnical Evaluation of Swamp Creek Sewer Alternatives

King County Department of Natural Resources

Water Pollution Control Division

Introduction

The Swamp Creek Sewer Extension Study involves evaluating possible pipeline alignments to connect the existing 36-inch diameter Swamp Creek Interceptor to the Alderwood Water and Sewer District's (AWSD) 36-inch diameter Swamp Creek sewer at the King/Snohomish County line on NE 73rd Avenue. The existing Swamp Creek interceptor terminates at the intersection of NE 191st Street and NE 73rd Avenue. The Alderwood Water and Sewer District's Swamp Creek Sewer terminates at the King/Snohomish County line on NE 73rd Avenue. Presently, two sewer extension alignments are being considered: the Swamp Creek Alternative and the NE 73rd Alternative.

The Swamp Creek alternative, Figure 1, parallels the existing Northshore Utility Districts (NUD) local connecting sewer adjacent to the existing 10-foot utility right-of-way. From the northern terminus of the existing Swamp Creek Interceptor near the intersection of NE 73rd and NE 191st Street, the Swamp Creek alternative proceeds westward along NE 191st Street to the east side of Kenmore Elementary School. The route then turns north and continues along the west side of Swamp Creek to the terminus at the King/Snohomish County Line at NE 73rd Avenue. The alignment crosses Swamp Creek just south of the county line. Depth of excavation along the Swamp Creek route is expected to vary from 10 to 20 feet.

The Northeast 73rd Avenue alternative would follow the roadway north to the King/Snohomish County Line, Figure 2. This route crosses Swamp Creek at NE 192nd Street and continues northwards along NE 73rd Avenue. Depth of excavation along the

NE 73rd Avenue alternative is expected to vary from 15 to 36 feet. The deepest cuts will be required in the area between Stations 22+00 to 42+00.

Scope of Work

The purpose of the geotechnical evaluation, Task 1.3 of the Swamp Creek Sewer Planning Study, is to classify the soil and groundwater conditions along the proposed alignment alternatives, to aid in the selection of the preferred alternative. Subsurface explorations such as borings and test pits were not completed during this phase of the project. The scope of work for Task 1.3 - Geotechnical Evaluation, consists of a review of existing information regarding the geotechnical, geological, and groundwater conditions for both alternatives, and providing recommendations for additional subsurface investigation required for pipeline design.

Existing Data Review

Several public agencies were contacted to locate and obtain geotechnical data for the project area. These agencies included:

- King County Department of Natural Resources
- King County Bridges
- King County Soils and Materials Lab
- Northshore Utility District
- Alderwood Water and Sewer District
- City of Brier
- Washington State Department of Ecology
- Washington State Department of Natural Resources
- United States Geologic Survey

The geotechnical information was found to be fairly sparse. No records of geotechnical borings or well logs were found in the project area. The information contained in the King County Department of Natural Resources Pollution Control Division (Metro) Library pertained primarily to the existing Swamp Creek Interceptor and the Kenmore Interceptor which are south of the project area. King County Roads and Engineering, Bridges, and the Soils Materials Laboratory, were unable to locate any geotechnical information for NE 73rd Avenue, or for the bridge recently completed across Swamp Creek near the intersection of NE 192nd Street and NE 73rd Avenue.

The Alderwood Water and Sewer district was unable to provide any useful geotechnical information for the project area.

The Northshore School District No. 417 provided a geotechnical report for improvements completed along the western side of the school. Test pits were excavated along the west side of the school and encountered native soils consisting of dense sands, and sandy gravel.

The Northshore Utility District (NUD) was able to provide inspector field notes recorded during the construction of the NUD local connecting sewer that the Swamp Creek Alternative sewer route parallels. The field notes indicate that construction of the sewer was accomplished during July and October of 1965. The sewer excavation was typically shored using steel trench boxes. Excavation depths varied from 8 to up to 20 feet, but averaged between 10 to 15 feet. Typical soil conditions reported to have been encountered at the pipe invert elevation consisted of "washed gravel".

U.S. Geological Survey maps provided general soil information for the surrounding area. The mapped information was partially verified in the project area by observing isolated soil exposures, and the regional information was verified through existing test pit logs, and through well logs obtained from the Washington State Department of Ecology.

Surficial Conditions

Swamp Creek Alternative: The southern portion of the Swamp Creek Alternative follows NE 191st Street to the Kenmore Elementary School. A 3 to 5 feet deep drainage ditch is located along the northern shoulder of the roadway. Near the southeast corner of the school property, the route turns northward and parallels Swamp Creek until Station 41+00 where the sewer crosses the creek and then connects to the Alderwood Sewer District 36-inch sewer at NE 73rd Avenue, near Station 46+67. The ground surface along alignment generally increases in elevation from Station 0+00 to the northern terminus at Station 46+67. North of NE 191st Street, the area along the route is unpaved and undeveloped to the King-Snohomish County Line.

Northeast 73rd Avenue Alternative: It is our understanding that the proposed sewer alignment will be located within the existing paved roadway of NE 73rd Avenue. In general, NE 73rd Avenue traverses the upland east bank of the Swamp Creek drainage channel. The ground surface along the route increases in elevation from Station 0+00 to Station 33+50 and then decrease in elevation to the northern terminus at Station 43+95 at the King-Snohomish County line. There is a steep drop off along both sides of the roadway between Stations 2+00 to 5+00 and Stations 8+50 to 11+50.

The bridge across Swamp Creek on NE 73rd Avenue appears to have been recently widened. Concrete piles support the bridge deck. Numbered paint marks, which are typically painted on the pile to determine depth of embeddment are still visible. The marks indicate the piles were driven between 10 to 12 feet below the existing ground surface. Rip-rap consisting of 2-4 man sized boulders and concrete slabs line the creek bank adjacent to the bridge.

General Subsurface Conditions

Swamp Creek Alternative: According to the construction records for the NUD local connecting sewer, which the Swamp Creek alternative alignment parallels, the typical soil conditions encountered along the route consisted of surficial silty sands underlain by "washed hard gravel". Surficial soil conditions observed in the creek bed consist of sandy gravel and exposures along the creek bank consist of sandy gravel and gravely sand with occasional cobbles.

Groundwater levels observed during the installation of the NUD sewer, in the summer of 1965, were generally at a depth of 5 to 8 feet below the ground surface.

Northeast 73rd Avenue Alternative: Information on the subsurface conditions along the proposed NE 73rd Avenue route was obtained from surficial geology maps completed for the area. Based on the geologic map information, the soils underlying the NE 73rd Avenue route are primarily composed of glacial advance outwash (sand and gravel), except for the area between NE 192nd Street to NE 195th Street which is mapped as recent alluvium (clay to gravel). Exposed in the creek bank at the NE 73rd Avenue bridge is silty sandy gravel. Based on the mapped surficial geology, and limited soil exposures in the project area, the soil conditions are expected to be dense glacial and alluvial soils.

Between Stations 2+00 to 5+00 and Stations 8+50 to 11+50, the roadway is higher than the surrounding area and very close to Swamp Creek. In this area the roadway is likely constructed on fill overlying alluvial deposits.

Information regarding groundwater conditions along the proposed route was not available. However, in the vicinity of the bridge across Swamp Creek, we expect groundwater levels to be at or near the elevation of the creek and will fluctuate with the creek level. Perched water may also be encountered in clean sand layers within the glacial soils.

CONCLUSIONS AND RECOMMENDATIONS

Swamp Creek Alternative

The proposed sewer route parallels the existing NUD local connecting sewer within the 10-foot utility right-of-way. We expect soil and groundwater conditions will be similar to those reported in the NUD construction records. Excavation depths, varying from 10 to 20 feet, are anticipated to be 2 to 3 feet below the existing NUD sewer. Construction can likely be carried out using open cut techniques and a trench box to provide temporary shoring. Temporary shoring will be necessary to support the trench sidewalls and to prevent damaging or undermining the NUD sewer. Open cut construction may cause ground movement in the area parallel to the excavation. Ground movement is typically

restricted to within a horizontal distance of 1.5 to 2 times the depth of the excavation. Houses and/or utilities within this area should be protected against damage and should be monitored for movement, during construction.

Imported backfill for pipe bedding will likely be required over most of the route, due to the high gravel content of the material. Since the area along the route is undeveloped backfill material requirements and compaction criteria will be less stringent than those required for the 73rd Avenue alignment alternative.

Because of the high groundwater table within the creek bed dewatering measures (sumps and/or well points) will likely be required during construction. Based on groundwater levels reported in the NUD construction notes, we anticipate that the invert of the proposed sewer will be 5 to 10 feet below the groundwater levels reported for the summer of 1965. No information was available regarding how groundwater was managed during construction of the NUD sewer. Construction should likely be completed during the dry summer months, when the creek and groundwater levels are at their lowest. According to local landowners Swamp Creek occasionally floods during the wet season.

Swamp Creek Crossing: The Swamp Creek Alternative crosses Swamp Creek near Station 41+00 near the northern terminus. Open cut and jack and bore methods are feasible methods for crossing the creek. Boulders and wood debris may be encountered within the creek channel that would make jack and bore methods difficult.

Northeast 73rd Avenue Alternative

Dense glacial soils along with perched water and groundwater will likely be encountered over most of the NE 73rd Avenue alignment. Glacial till, consisting of sandy silt with gravel, may also be encountered. In the area between Stations 2+00 to 5+00 and 8+50 to 11+50 alluvial deposits of sand and gravel will likely be encountered beneath the roadway fill. The southern portion of the route from Station 0+00 to 14+00 is close to Swamp Creek and groundwater will likely be encountered at the creek elevation. Perched water may also be encountered within the glacial deposits.

Open-Cut Construction

The deep excavation depths will require sloped sidewalls, and/or temporary shoring, or trenchless construction methods. Temporary shoring consisting of stacked trench boxes is typically limited to depths of about 20 feet. Excavations in excess of 20 feet, that can not be sloped, will likely require temporary shoring consisting of soldier piles and lagging. Because of the anticipated dense nature of the native soils, we expect sheet piles would be difficult to install and are not a viable trench shoring method for this project.

Readily available tracked excavators are generally limited to depths of 25 feet. Greater excavation depths will require specialized excavators with long booms or benching the cut to lower the excavators. Overhead obstructions such as power, telephone, and cable TV lines may obstruct long boomed excavators.

Open cut construction will also result in ground movement along the trench. The maximum ground subsidence will occur adjacent to the trench and diminish with distance from the trench. The area outside of a horizontal distance of 1½ to 2 times the trench depth is generally not affected by trenching. Utilities or structures that are within this zone of influence or on the ground surface above the zone of influence may be affected by ground movement. The amount of ground movement will greatly depend on the method of construction, quality of workmanship, and ground conditions. Excessive subsidence can occur as a result of poor shoring construction, improper dewatering design and installation, and lack of monitoring to detect problems.

Avoidable settlement can occur near trench excavations as a result of loss of ground by either removal of fines through improperly constructed dewatering wells or well points, or by piping of fines into the excavation. Loss of ground can be prevented by proper design and operation of the dewatering system, if one is determined to be required. Additional settlement can occur as a result of poor construction practices during the installation of temporary shoring components. The amount of additional ground movements will depend on the shoring system used and the Contractor's method of construction.

Open cut construction methods to the depths required on this project will also generate a large volume of excavation spoils. Excavation spoils will need to be stockpiled along the roadway or exported off site. If excavation spoils have a high fines content it will be difficult to reuse as backfill during wet weather conditions or if significant amounts of perched water or groundwater are encountered during excavation. If excavation spoils are not reusable as backfill, import fill will be required.

It will be necessary to compact the trench backfill to between 92 to 95 percent of the maximum dry density, in order to provide adequate support for the roadway surface.

Swamp Creek Crossing: The sewer route across Swamp Creek would need to be accomplished on either the east or west side of the roadway to avoid the bridge pile foundations. On the west side of the bridge is an 8-inch diameter high pressure gas main. The crossing could be accomplished using either open cut construction methods or jack and bore. However, the dense glacial material and the possibility of encountering boulder obstructions or wood debris may make jack and bore methods difficult.

Trenchless Construction

Currently we understand that trenchless construction is being proposed between the existing Metro manhole at the intersection of NE 191st Street and 73rd Avenue NE Station 1+50 to approximate Station 4+00 and between Stations 20+50 and 42+24.

Trenchless pipe installation methods such as jacking and boring or micro-tunneling can be viable alternatives to open cut construction. Micro-tunneling refers to trenchless excavation by an automated, remotely guided boring machine with ground support provided by pipe jacking. Jacking and boring refers to trenchless excavation by auger boring methods with ground support provided by pipe jacking. Jack and bore installation requires dewatered ground conditions for the entire length of the pipe.

Micro-tunneling is applicable in most soil conditions and can be accomplished below the water table. The tunneling method and machine selection must be tailored with the anticipated soil and groundwater conditions. Obstructions such as buried logs of boulders can slow or halt the tunneling machine. In general, for micro-tunneling to be suitable, the largest cobble size expected should be less than about 1/3 the diameter of the micro-tunneling machine.

Micro-tunneling and jack and bore methods must be done in straight line segments. In both methods, the machine or boring is launched from a jacking or boring pit at one end of the pipeline segment to a receiving pit at the other end.

In micro-tunneling the length of the pipe segment that can be completed from one jacking pit is based on: the soil conditions, the type of pipe material, and the microtunneling equipment. Typically, a 36 to 48-inch diameter machine is capable of completing segments of about 400 to feet in length. Additional jacking stations can be added to the pipe as it is installed to increase the length of pipe that can be installed from the jacking pit. However, the addition of jacking stations to the pipe significantly decreases construction progress.

Typical costs for installing a 36-inch inside diameter concrete pipe are estimated to vary from $750 to $1000 per foot.

Resistance to pipe jacking in the launch pit will depend on the ground conditions, methods of construction, and the type of tunneling equipment. Factors that may be considered to estimate pipe jacking resistance include: details of construction methods such as degree of overcut, manner in which the tunneling machine face pressure is controlled, how the soil cuttings are removed, and the effectiveness of bentonite lubrication along the pipe length behind the tunneling machine. Resistance to pipe jacking cannot be estimated based only on in-situ soil properties. In trenchless construction projects, pipe resistance to jacking should be estimated based on the Contractor's experience in similar subsurface conditions, construction method, and type of tunneling equipment.

Passive resistance of the soil in the walls of the launch pit will be utilized to develop the necessary jacking thrust reaction to overcome the frictional resistance developed along the pipe. The amount of soil resistance will increase as the reaction block is displaced into the soil surface surrounding the jacking pit. The structural capacity of the jacking pit to accommodate lateral displacements will control the selection of allowable passive soil resistance. To provide recommendations for the available passive resistance that the soil can provide a test pit or boring would be necessary at each jacking pit location.

Additional Services

Once the preferred alternative is selected we recommend performing a field investigation to determine the specific soil and groundwater conditions along the proposed alignment.

The lack of existing geotechnical information will require a detailed field investigation for whichever sewer alignment alternative is selected. We have provided below a field investigation scope of work for each sewer alignment alternative. We assume that prior to beginning the field investigation the preferred alignment will be surveyed and staked to assist in locating test pits and boring locations.

Swamp Creek Alternative - Proposed Field Investigation

. Excavate a total of 10 test pits along the proposed sewer alignment. Test pits will be excavated with a tracked excavator capable of excavating to a depth of 20 feet. Prior to excavating the test pits current land owners will need to be contacted and permission to excavate on their property will be necessary. The current right-of-way is only 10 feet wide. In order to excavate test pits to the required depth of investigation and not disturb the existing NUD sewer the test pit will need to be located on property adjacent to the right-of-way, and be kept a minimum of 10 feet away from the existing sewer.

2. Drill a total of 5 soil borings along the alignment and install temporary monitoring wells to obtain groundwater information and to perform well tests. Boring depths will range from 15 to 25 feet to investigate soil and groundwater conditions at the proposed pipe invert elevations. Relatively undisturbed samples will be collected for testing to determine soil parameters.

3. Perform in-situ permeability tests in the monitoring wells and/or percolation tests in the test pits to quantify soil permeability characteristics. This information will be used to provide dewatering

recommendations and for use in design of dewatering methods during construction.

4. Evaluate alternatives for crossing Swamp Creek. Construction methods such as open cut and jack and bore will be evaluated.

A King County grading permit may be required for completing exploration work along the Swamp Creek Alternative route, since the route may cross wetland areas, therefore restoration work may be required to return subsurface exploration locations to existing conditions.

Northeast 73rd Avenue Alternative - Proposed Field Investigation

1. Drill a total of 12 soil borings along the alignment and install approximately 10 temporary monitoring wells to obtain groundwater information and to perform in-situ permeability tests. Borings will be drilled at probable jacking pit and receiving pit locations. Borings will likely be drilled in the roadway, thus a traffic control plan and flaggers will be required. Boring depths will range from 20 to 60 feet to investigate soil and groundwater conditions at the proposed pipe invert elevations. Relatively undisturbed samples will be collected for laboratory testing to determine soil parameters.

2. Perform variable head or slug tests in the monitoring wells to quantify soil permeability characteristics. This information will be used to provide dewatering recommendations and for use in design of dewatering methods.

3. Evaluate alternatives for crossing Swamp Creek. The feasibility of traditional construction methods such as open cut and jack and bore will be evaluated.

References

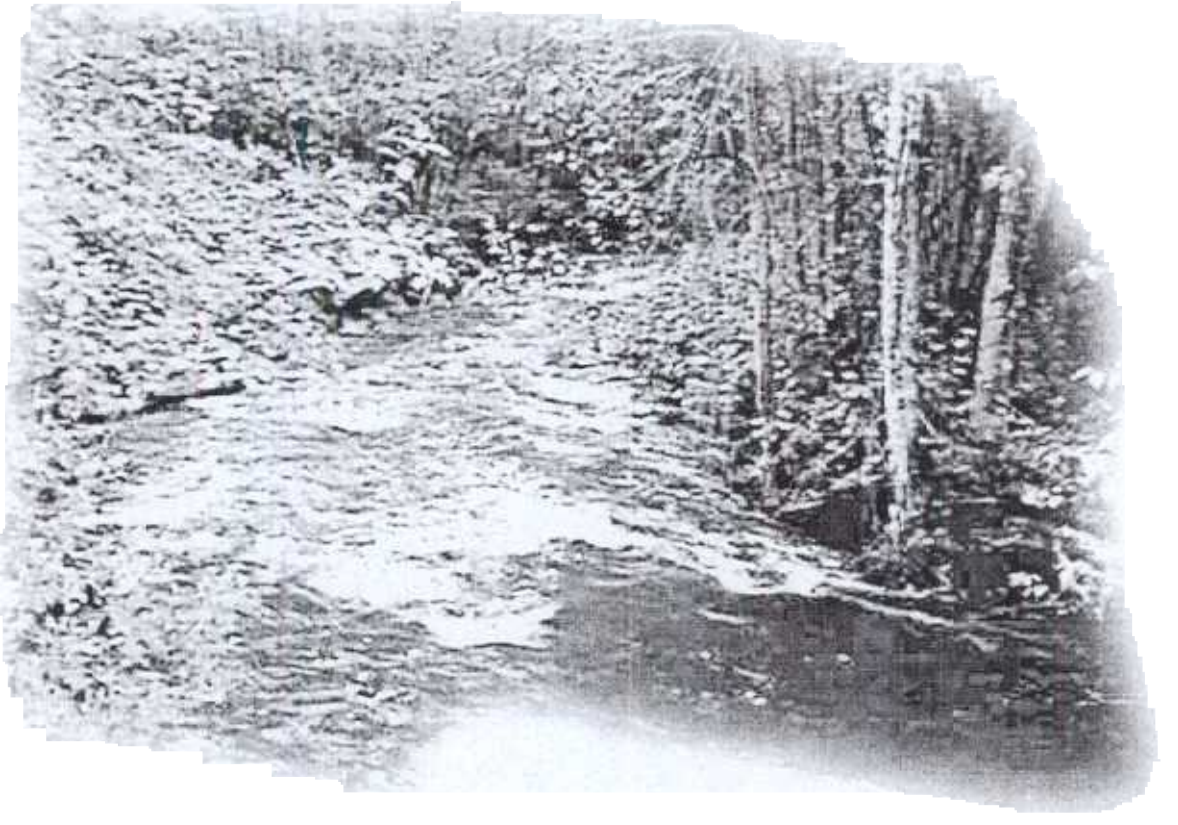
Yount, J.C.; Minard J.P.; and Dembroff, G.P, 1993, Geologic Map of Surficial Deposits in the Seattle 30' x 60' Quadrangle, Washington, United States Dept. of Interior, U.S. Geologic Survey, Open File Report 93-233, 2 sheets.

Galster, Richard W.; Laprade, W.T., 1991, Geology of Seattle, Washington, United States of America, Bull. of Association of Engineering Geologists, Vol. 28, No. 3, August 1991, pp. 235 - 302.

Northshore Utility District, As-built Construction Records for Swamp Creek Local Connecting Sewer, Manholes 600 to 703, 1965.

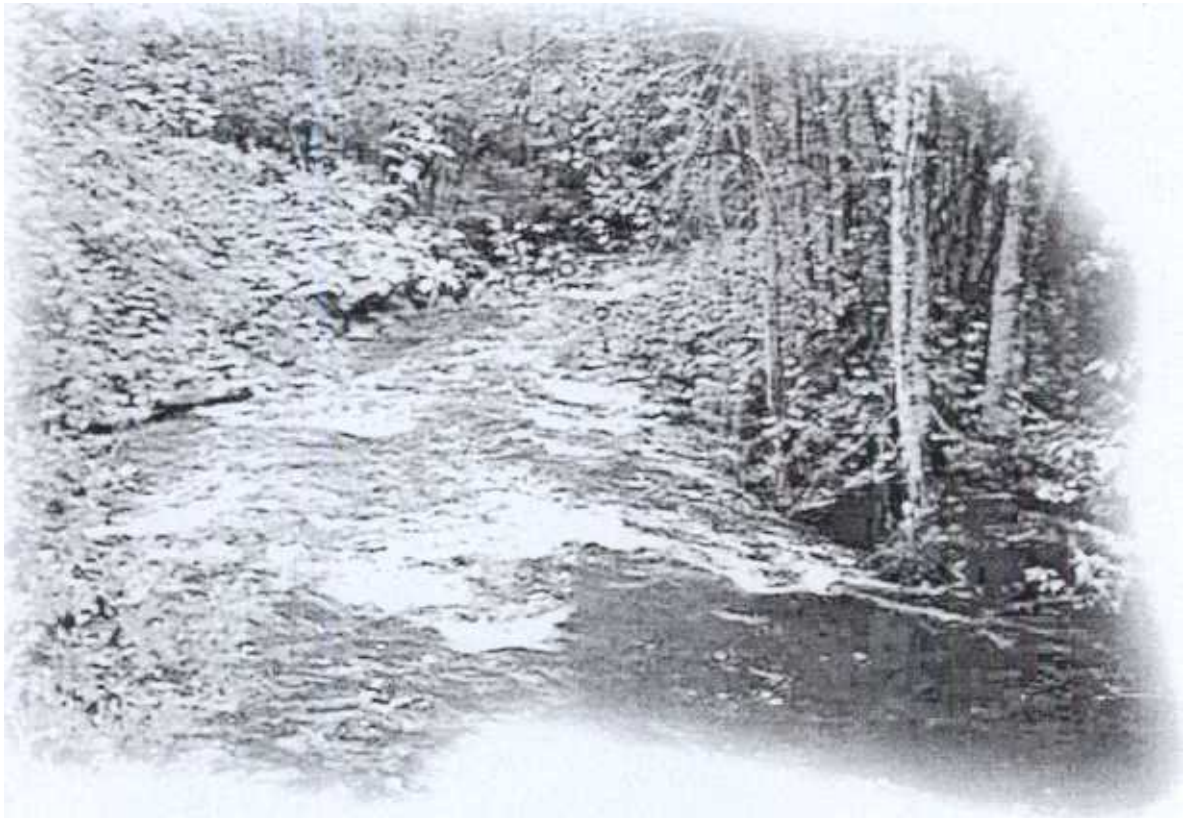
APPENDIX B-1

Swamp Creek Watershed Map
(Snohomish County, 1994)



APPENDIX B-2

King County Traffic Counts



KING COUNTY - 1985 THRU 1995 HISTORICAL ADT COUNTS BY LOCATION
AVERAGE DAILY TRAFFIC VOLUMES

ADT FILE NUMBER	NAME OF LEG	THE LEG	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985
1114	NE 205 ST	E	0	0	0	0	0	0	0	0	0	0	0
1114	15 AVE NE	S	11573	10698	10687	10346	10540	11318	10203	9394	0	0	0
1114	15 AVE NE	S-NB	5939	5669	5663	5421	5399	5558	5196	4830	0	0	0
1114	15 AVE NE	S-SB	5634	5029	5024	4925	5141	5760	5007	4564	0	0	0
1114	NE 205 ST	W	0	0	0	0	0	0	0	0	0	0	0
2001	55 AVE NE	N	3818	3918	3841	3753	3896	4240	3861	3692	3578	2978	2962
2001	55 AVE NE	N-NB	1898	1995	1956	1884	1937	2141	1943	0	0	0	0
2001	55 AVE NE	N-SB	1920	1923	1885	1869	1959	2099	1918	0	0	0	0
2001	55 AVE NE	S	5266	5168	5067	5219	5137	5841	5368	5009	4854	4275	4348
2001	55 AVE NE	S-NB	2561	2392	2345	2514	2506	2907	2613	0	0	0	0
2001	55 AVE NE	S-SB	2705	2776	2722	2705	2631	2934	2755	0	0	0	0
2001	NE 204 ST	W	2466	2539	2489	2424	2362	2477	2445	2546	2467	1975	1688
2001	NE 204 ST	W-EB	1286	1374	1347	1300	1280	1338	1290	0	0	0	0
2001	NE 204 ST	W-WB	1180	1165	1142	1124	1082	1139	1155	0	0	0	0
2003	61 PL NE	N	6310	6358	6385	6493	6293	6395	6009	4961	4807	4649	4484
2003	61 PL NE	N-NB	3060	3096	3025	3099	3017	3069	2794	0	0	0	0
2003	61 PL NE	N-SB	3250	3262	3360	3394	3276	3326	3215	0	0	0	0
2003	61 PL NE	S	5872	5677	5974	5885	5817	5608	5519	4726	4579	4428	4344
2003	61 PL NE	S-NB	2762	2673	2704	2662	2675	2476	2483	0	0	0	0
2003	61 PL NE	S-SB	3110	3004	3270	3223	3142	3132	3036	0	0	0	0
2003	62 AVE NE	SE	1913	1809	1730	1977	1925	1671	1864	1801	1745	1688	1628
2003	62 AVE NE	SE-NWB	1079	1033	971	1123	1097	965	1024	0	0	0	0
2003	62 AVE NE	SE-SEB	834	776	759	854	828	706	840	0	0	0	0
2004	61 AVE NE	N	8171	8015	8210	8637	8612	8313	7477	7266	7136	6603	6739
2004	61 AVE NE	N-NB	3585	3698	3702	3920	3946	3809	3426	3329	0	0	0
2004	61 AVE NE	N-SB	4586	4317	4508	4717	4666	4504	4051	3937	0	0	0
2004	61 AVE NE	S	12442	12649	12484	12570	13615	13142	11825	11492	12332	10762	10514
2004	61 AVE NE	S-NB	6033	5747	5770	5807	6329	6109	5457	5303	0	0	0
2004	61 AVE NE	S-SB	6409	6902	6714	6763	7286	7033	6368	6189	0	0	0
2004	NE 193 ST	W	6034	6446	6008	6376	6536	6309	5870	5705	5950	5328	5536
2004	NE 193 ST	W-EB	3082	3338	2934	3382	3342	3226	3022	2937	0	0	0
2004	NE 193 ST	W-WB	2952	3108	3074	2994	3194	3083	2848	2768	0	0	0
2005	SR 522	E	0	0	0	0	0	0	0	0	0	0	0
2005	61 AVE NE	N	11997	12530	11392	12056	11902	12873	11000	9914	9774	9453	10109
2005	61 AVE NE	N-NB	5878	6088	5330	5678	5687	5921	5106	4644	0	0	0
2005	61 AVE NE	N-SB	6119	6442	6062	6378	6215	6952	5894	5270	0	0	0
2005	61 AVE NE	S	3500	4699	3984	4881	3787	4011	4253	2540	3906	3778	3644
2005	61 AVE NE	S-NB	1200	1658	1414	1835	1149	1413	1393	718	0	0	0
2005	61 AVE NE	S-SB	2300	3041	2570	3046	2638	2598	2860	1822	0	0	0
2005	SR 522	W	0	0	0	0	0	0	0	0	0	0	0
2006	NE 181 ST	E	4242	3962	4645	4645	4032	4790	4864	4530	4424	4927	4203
2006	NE 181 ST	E-EB	2329	2237	2428	2612	2243	2678	2739	2575	0	0	0
2006	NE 181 ST	E-WB	1913	1725	2217	2033	1789	2112	2125	1955	0	0	0
2006	68 AVE NE	N	6707	6155	6214	6235	6063	5786	6011	5737	5439	6013	5576
2006	68 AVE NE	N-NB	3361	3102	3126	3165	3022	2868	2987	2878	0	0	0
2006	68 AVE NE	N-SB	3346	3053	3088	3070	3041	2918	3024	2859	0	0	0

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ADT FILE NUMBER	NAME OF LEG	THE LEG	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985
2006	68 AVE NE	S	8966	8423	8414	8598	7999	8366	8592	7954	7657	8513	7850
2006	68 AVE NE	S-NB	4087	3819	3824	3744	3630	3845	3859	3740	0	0	0
2006	68 AVE NE	S-SB	4879	4604	4590	4854	4369	4521	4742	4214	0	0	0
2006	NE 181 ST	W	6692	6270	7271	7520	6542	8441	8763	8248	8012	7096	7525
2006	NE 181 ST	W-EB	3791	3597	3976	4271	3620	4926	5090	4799	0	0	0
2006	NE 181 ST	W-WB	2901	2673	3295	3249	2922	3515	3673	3449	0	0	0
2007	NE 175 ST	E	2193	2215	2317	2010	2008	2352	2417	3102	2577	2492	2404
2007	NE 175 ST	E-EB	1315	1348	1284	1483	1243	1393	1502	2240	0	0	0
2007	NE 175 ST	E-WB	878	867	1033	527	765	959	915	862	0	0	0
2007	68 AVE NE	N	26188	24614	24659	24062	24144	23968	23142	24927	23625	22848	22033
2007	68 AVE NE	N-NB	12967	12987	12111	11169	12024	11719	11696	12564	0	0	0
2007	68 AVE NE	N-SB	13221	11627	12548	12893	12120	12249	11446	12363	0	0	0
2007	68 AVE NE	S	29017	27845	27306	24958	26639	26778	27996	27455	26268	24652	23773
2007	68 AVE NE	S-NB	14271	13500	13874	13746	13081	13419	13561	0	0	0	0
2007	68 AVE NE	S-SB	14746	14345	13432	11212	13558	13359	14435	0	0	0	0
2007	NE 175 ST	W	4087	3836	4948	4484	4448	4453	5095	3178	3066	2965	3391
2007	NE 175 ST	W-EB	2634	2466	3313	2828	2903	2823	3466	2336	0	0	0
2007	NE 175 ST	W-WB	1453	1370	1635	1656	1545	1630	1629	842	0	0	0
2008	SIMONDS RD	E	12085	11969	11981	11243	11912	12176	12674	11362	10168	10423	10639
2008	SIMONDS RD	E-EB	6247	6219	6177	5827	6010	6159	6502	5681	0	0	0
2008	SIMONDS RD	E-WB	5838	5750	5804	5416	5902	6017	6172	5681	0	0	0
2008	JUANITA DR	N	29017	27845	27306	27178	26639	26778	27996	27455	26268	24906	23773
2008	JUANITA DR	N-NB	14271	13500	13874	13746	13081	13419	13561	13419	0	0	0
2008	JUANITA DR	N-SB	14746	14345	13432	11212	13558	13359	14435	14036	0	0	0
2008	JUANITA DR	S	17947	17032	17011	15552	15412	15948	16048	16820	16300	14076	14309
2008	JUANITA DR	S-NB	8530	8340	8309	7364	7021	7796	8067	8275	0	0	0
2008	JUANITA DR	S-SB	9417	8692	8702	8188	8391	8152	7981	8545	0	0	0
2008	SIMONDS RD	W	1761	1700	1757	1496	1845	1494	1676	1876	1832	1772	1709
2008	SIMONDS RD	W-EB	874	1001	877	745	913	569	872	0	0	0	0
2008	SIMONDS RD	W-WB	887	699	880	751	932	925	804	0	0	0	0
2009	NE 153 PL	E	2771	2540	2575	2753	2611	2709	2612	3065	2970	2095	2485
2009	NE 153 PL	E-EB	1610	1390	1421	1654	1406	1462	1410	0	0	0	0
2009	NE 153 PL	E-WB	1161	1150	1154	1099	1205	1246	1202	0	0	0	0
2009	JUANITA DR	N	14264	14148	13727	13395	14105	14016	13516	14510	14060	12491	12732
2009	JUANITA DR	N-NB	7051	6842	6726	6589	6749	7471	7204	0	0	0	0
2009	JUANITA DR	N-SB	7213	7306	7001	6806	7356	6546	6312	0	0	0	0
2009	JUANITA DR	S	13032	12401	13216	12088	12695	14096	13593	12669	12276	10649	10738
2009	JUANITA DR	S-NB	6171	5892	6733	5692	6264	7920	7637	0	0	0	0
2009	JUANITA DR	S-SB	6861	6509	6483	6396	6431	6176	5956	0	0	0	0
2009	NE 153 PL	W	4250	3938	4119	3726	4243	4113	3966	4183	4053	3721	3658
2009	NE 153 PL	W-EB	2089	1899	2006	1519	2037	2034	1961	0	0	0	0
2009	NE 153 PL	W-WB	2161	2039	2113	2207	2296	2079	2005	0	0	0	0
2011	NE 141 ST	E	3900	3418	3287	3443	3447	3033	2925	3236	3323	3068	2547
2011	NE 141 ST	E-EB	1772	1513	1465	1658	1618	1692	1632	1501	0	0	0
2011	NE 141 ST	E-WB	2128	1901	1822	1785	1829	1341	1293	1735	0	0	0
2011	JUANITA DR	N	10529	10637	9980	11514	10610	10325	9957	10713	10182	8508	9234
2011	JUANITA DR	N-NB	5329	5437	4799	5590	5163	4990	4812	5207	0	0	0

= Projected count

KING COUNTY 1985 THRU 1995 HISTORICAL ADT COUNTS BY LOCATION
AVERAGE DAILY TRAFFIC VOLUMES

ADT FILE NUMBER	NAME OF LEG	THE LEG	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985
2011	JUANITA DR	N-SB	5200	5230	5181	5924	5447	5335	5145	5506	0	0	0
2011	JUANITA DR	S	10980	10754	10635	10621	10707	10199	9835	10497	9770	7801	8679
2011	JUANITA DR	S-NB	5464	5180	5186	5164	5285	4960	4783	5255	0	0	0
2011	JUANITA DR	S-SB	5516	5574	5449	5457	5422	5239	5052	5242	0	0	0
2011	HOLMES PT DR	W	1574	1594	1511	1508	1709	1523	1469	1520	1409	1297	1186
2011	HOLMES PT DR	W-EB	782	796	735	745	845	739	713	784	0	0	0
2011	HOLMES PT DR	W-WB	792	798	776	763	864	784	756	736	0	0	0
2012	NE 132 ST	E	1639	1126	1104	1632	1575	1520	1466	1425	1381	945	912
2012	NE 132 ST	E-EB	772	518	508	0	0	0	0	0	0	0	0
2012	NE 132 ST	E-WB	867	608	596	0	0	0	0	0	0	0	0
2012	JUANITA DR	N	11403	10084	9886	11104	10718	10346	9977	9696	9395	8544	8240
2012	JUANITA DR	N-NB	5706	4834	4739	0	0	0	0	0	0	0	0
2012	JUANITA DR	N-SB	5697	5250	5147	0	0	0	0	0	0	0	0
2012	JUANITA DR	S	11243	10037	9840	11133	10746	10373	10003	9721	9420	8490	8188
2012	JUANITA DR	S-NB	5444	4763	4670	0	0	0	0	0	0	0	0
2012	JUANITA DR	S-SB	5799	5273	5170	0	0	0	0	0	0	0	0
2013	NE 122 PL	E	2453	2385	2338	2436	2550	2481	2395	2384	2310	2403	2098
2013	NE 122 PL	E-EB	1282	1255	1230	1313	1376	1262	1219	0	0	0	0
2013	NE 122 PL	E-WB	1171	1130	1108	1123	1174	1219	1176	0	0	0	0
2013	JUANITA DR	N	12069	9939	9744	11194	11374	10468	10284	9747	9445	8132	8407
2013	JUANITA DR	N-NB	6048	5093	4993	5299	5455	4990	4943	0	0	0	0
2013	JUANITA DR	N-SB	6021	4846	4751	5895	5919	5478	5341	0	0	0	0
2013	HOLMES PT DR	S	2284	2087	2046	2108	2369	2196	2205	2131	2065	2159	1805
2013	HOLMES PT DR	S-NB	1057	1027	1007	1033	1159	1093	1100	0	0	0	0
2013	HOLMES PT DR	S-SB	1227	1060	1039	1075	1210	1103	1105	0	0	0	0
2013	JUANITA DR	SE	15164	13733	13464	14062	14774	13410	13160	12194	11816	10099	11765
2013	JUANITA DR	SE-NWB	7289	6637	6507	6839	7191	6610	6446	0	0	0	0
2013	JUANITA DR	SE-SEB	7875	7096	6957	7223	7583	6800	6714	0	0	0	0
2014	NE 192 ST	E	4274	3790	4090	3822	4685	4522	4361	4238	4107	3972	4325
2014	NE 192 ST	E-EB	2264	2060	2202	2033	0	0	0	0	0	0	0
2014	NE 192 ST	E-WB	2010	1730	1888	1789	0	0	0	0	0	0	0
2014	73 AVE NE	N	3314	2973	3242	3283	3398	3280	3163	3074	2979	2881	2771
2014	73 AVE NE	N-NB	1777	1503	1650	1707	0	0	0	0	0	0	0
2014	73 AVE NE	N-SB	1537	1470	1592	1576	0	0	0	0	0	0	0
2014	73 AVE NE	S	6155	5657	6296	5689	7073	6827	6583	6397	6199	5995	5782
2014	73 AVE NE	S-NB	3098	2986	3271	3019	0	0	0	0	0	0	0
2014	73 AVE NE	S-SB	3057	2671	3025	2670	0	0	0	0	0	0	0
2015	NE 181 ST	E	1110	877	1113	1024	907	1250	1028	1560	1512	1462	1416
2015	NE 181 ST	E-EB	494	380	437	412	402	565	460	0	0	0	0
2015	NE 181 ST	E-WB	616	497	676	612	505	685	568	0	0	0	0
2015	73 AVE NE	N	7804	7294	7591	7398	7826	7597	7391	7054	6835	6610	6638
2015	73 AVE NE	N-NB	4120	3825	3979	3886	4062	3923	3798	0	0	0	0
2015	73 AVE NE	N-SB	3684	3469	3612	3512	3764	3674	3593	0	0	0	0
2015	73 AVE NE	S	7261	6906	6688	7007	7302	7652	6891	7280	7054	6822	6621
2015	73 AVE NE	S-NB	3386	3079	3280	3204	3279	3417	3024	0	0	0	0
2015	73 AVE NE	S-SB	3875	3827	3408	3803	4023	4235	3867	0	0	0	0
2015	NE 181 ST	W	3905	3524	3870	3563	3722	4142	4340	5059	4902	4743	4589

APPENDIX B-3

King County Zoning Code
(Sec. 21A.24.330.F)

2. the utility corridor meets any additional requirements set forth in administrative rules including, but not limited to, requirements for installation, replacement of vegetation and maintenance;

F. Sewer utility corridors may be allowed in wetland buffers only if:

1. the applicant demonstrates that sewer lines are necessary for gravity flow;

2. the corridor is not located in a wetland or buffer used by species listed as endangered or threatened by the state or federal government or containing critical or outstanding actual habitat for those species or heron rookeries or raptor nesting trees;

3. the corridor alignment including, but not limited to, any allowed maintenance roads follows a path beyond a distance equal to 75% of the buffer width from the wetland edge;

4. corridor construction and maintenance protects the wetland and buffer and is aligned to avoid cutting trees greater than 12 inches in diameter at breast height, when possible, and pesticides, herbicides and other hazardous substances are not used;

5. an additional, contiguous and undisturbed buffer, equal in width to the proposed corridor including any allowed maintenance roads, is provided to protect the wetland;

6. the corridor is revegetated with appropriate vegetation native to King County at pre-construction densities or greater immediately upon completion of construction or as soon thereafter as possible, and the sewer utility ensures that such vegetation survives;

7. any additional corridor access for maintenance is provided, to the extent possible, at specific points rather than by a parallel road; and

8. the width of any necessary parallel road providing access for maintenance is as small as possible, but not greater than 15 feet, the road is maintained without the use of herbicides, pesticides or other hazardous substances and the location of the road is contiguous to the utility corridor on the side away from the wetland;

G. Joint use of an approved sewer utility corridor by other utilities may be allowed.

H. The following surface water management activities and facilities may be allowed in wetland or their buffers only as follows:

1. surface water discharge to a wetland from a detention facility, pre-settlement pond or other surface water management activity or facility may be allowed if the discharge does not increase the rate of flow, change the plant composition in a forested wetland or decrease the water quality of the wetland;

2. a class 1, 2 or 3 wetland or buffer may be used for a regional retention/detention facility if:

a. a public agency and utility exception is granted pursuant to K.C.C. 21A.24.070;

b. all requirements of the Surface Water Design Manual are met;

c. the use will not alter the rating or the factors used in rating the wetland;

d. the proposal is in compliance with the latest adopted findings of the Puget Sound Wetlands Research Project; and

e. there are no significant adverse impacts to the wetland;

3. isolated class 3 wetlands and buffers which are grazed wet meadows may be used as a retention/detention facility if a pre-settlement pond is required providing that they are not part of an LSRA, RSRA or a designated riparian corridor and all requirements of the Surface Water Design Manual are met; and

4. use of a wetland buffer for a surface water management activity or facility, other than a retention/detention facility, such as an energy dissipater and associated pipes, may be allowed only if the applicant demonstrates, to the satisfaction of King County, that:

a. no practicable alternative exists; and

b. the functions of the buffer or the wetland are not adversely affected;

I. Public and private trails may be allowed in wetland buffers only upon adoption of administrative rules consistent with the following:

APPENDIX B-4

King County Zoning Code
(Sec. 21A.24 370.G)

C. There shall be no introduction of any plant or wildlife which is not indigenous to King County into any stream or buffer unless authorized by a state or federal permit or approval;

D. Utilities may be allowed in stream buffers if:

1. no practical alternative location is available;

2. the utility corridor meets any additional requirements set forth in administrative rules including, but not limited to, requirements for installation, replacement of vegetation and maintenance;

3. the requirements for sewer utility corridors in K.C.C. 21A.24.330 shall also apply to streams; and

4. joint use of an approved sewer utility corridor by other utilities may be allowed.

E. The following surface water management activities and facilities may be allowed in stream buffers as follows:

1. surface water discharge to a stream from a detention facility, pre-settlement pond or other surface water management activity or facility may be allowed if the discharge is in compliance with the Surface Water Design Manual;

2. a class 2 stream or buffer may be used for a regional retention/detention facility if:

a. a public agency and utility exception is granted pursuant to K.C.C. 21A.24.070;

b. all requirements of the Surface Water Design Manual are met;

c. the use will not alter the rating or the factors used in rating the stream;

d. there are no significant adverse impacts to the stream; and

3. a class 3 stream or buffer may be used as a regional retention/detention facility if the alteration will have no lasting adverse impact on any stream and all requirements of the Surface Water Design Manual are met;

F. Except as provided in subsection G, public and private trails may be allowed in stream buffers only upon adoption of administrative rules consistent with the following:

1. the trail surface shall not be made of impervious materials, except that public multi-purpose trails such as the Burke-Gilman Trail may be made of impervious materials if they meet all other requirements including water quality; and

2. buffers shall be expanded, where possible, equal to the width of the trail corridor including disturbed areas;

G. Stream crossings may be allowed and may encroach on the otherwise required stream buffer if:

1. all crossings use bridges or other construction techniques which do not disturb the stream bed or bank, except that bottomless culverts or other appropriate methods demonstrated to provide fisheries protection may be used for class 2 or 3 streams if the applicant demonstrates that such methods and their implementation will pose no harm to the stream or inhibit migration of fish;

2. all crossings are constructed during the summer low flow and are timed to avoid stream disturbance during periods when use is critical to salmonids;

3. crossings do not occur over salmonid spawning areas unless King County determines that no other possible crossing site exists;

4. bridge piers or abutments are not placed within the FEMA floodway or the ordinary high water mark;

5. crossings do not diminish the flood-carrying capacity of the stream;

6. underground utility crossings are laterally drilled and located at a depth of four feet below the maximum depth of scour for the base flood predicted by a civil engineer licensed by the State of Washington. Temporary bore pits to perform such crossings may be permitted within the stream buffer established in section 21A.24.360. Crossing of Class 3 streams when dry may be made with open cuts; and

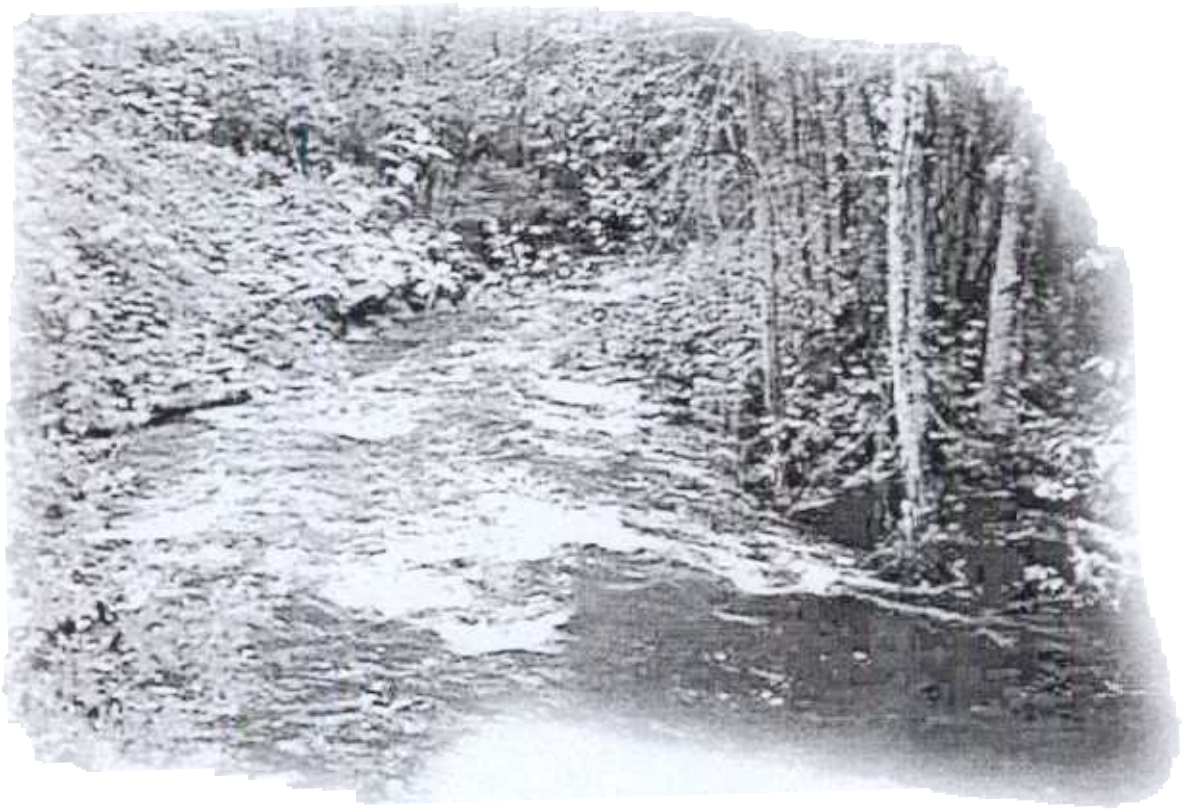
7. crossings are minimized and serve multiple purposes and properties whenever possible;

H. Stream relocations may be allowed only for:

1. class 2 streams as part of a public road project for which a public agency and utility exception is granted pursuant to K.C.C. 21A.24.050; and

APPENDIX B-5

King County Shoreline Management Master Program Utility Policies



General Policies

1. Mining in unique and fragile areas should not be allowed.

2. Consumptive and extractive industries should allow the natural shoreline systems to function with a minimum of disruption during their operations and should return the site to as near natural a state as possible upon their completion.

3. Mining in or under the waters of shorelines of the state in King County should be discouraged.

OUTDOOR ADVERTISING SIGNS AND BILLBOARDS

Outdoor advertisements and signs are publicly displayed messages designed to provide information, direction or advertising, and may be pleasing or distractin depending upon their number, design and location. The proliferation of signs has generally resulted in the reduced effectiveness of individual signs as well as having caused dangerous conflicts between advertising signs and traffic contr signs. The uncontrolled use of signs and their insistent demand for attention ca be detrimental to surrounding property values and may serisously detract from the enjoyment, pleasure, and the natural beauty of the shoreline. The following policies and regulations are written from the perspective that the shoreline char and attractiveness should be protected to the greatest extent possible from the ill effects of signs.

General Policies

1. Vistas and viewpoints should be free from unnecessary signs

2. Signs, when permitted, should be placed so as not to impair view of the wate or impair view upland from the water except where dangerous conditions requir warning signs.

3. Warning signs should be installed by King County or by other appropriate entities where hazardous conditions may exist.

4. Advertising signs when permitted should be limited to shoreline areas of high intensity use.

5. Signs in shoreline areas should be maintained in a state of security, safety and repair.

6. Any new sign codes for King County should recognize the unique aesthetic character and ecological qualities of shoreline areas.

UTILITIES

Few, if any, utility systems could be installed completely without coming under the jurisdiction of this Master Program. The focus of the policies

in this section is on how these utility facilities within the wetland area can be planned, designed, constructed, maintained and rehabilitated to be consistent with the intent of the Shoreline Management Act of 1971.

Types of utility facilities in King County vary from regional transmission by trunklines, pipelines and transmission lines to subregional distribution facilities. These are essentially pipes and wires. Regional facilities generally are high voltage or high pressure systems with substantial potential impact in case of failure. Their impacts on the environment are generally greater also because of their scale and safety requirements.

The types of utilities covered are communications (radio, T.V., telephone), energy distribution (petroleum products, natural gas, and electricity), water, sanitary sewers, and storm sewers. Solid waste utilities are disucssed as a separate Use Activity in this Master Program.

General Policies

1. Utilities which lead growth should not be extended into any wetland or along shorelines without prior approval of such extension by appropriate land use authority.

2. Utilities located in wetlands inappropriate for development should not make service available to those areas.

3. In developed wetlands not served by utilities, utility construction should be encouraged to locate where it can be shown that water quality will be maintained or improved.

4. King County should be consulted prior to or at the time of application for construction of regional utility facilities to be located in or along shorelines or wetlands.

5. Utility corridors crossing shorelines of the state shou'd be encouraged to consolidate and concentrate or share rights-of-way where:

   a. Public access (including view) would be improved.

   b. Concentration or sharing would not hinder the ability of the utility systems to be installed, operated or maintained safely.

   c. Water quality would be as good or better than if separate corridors were present.

6. Public access consistent with public safety and security should be encouraged where rights-of-way for regional utility facilities cross shorelines of the state.

7. New utility facilities should be located so as neither to require extensive shoreline protection nor to restrict water flow, circulation or navigation.

8. Utility facilities and rights-of-way should be selected to preserve the natural landscape and minimize conflicts with present and planned uses of the land on which they are located.

9. New utility routes should be designed to minimize detrimental visual impact from the water and adjacent uplands.

PORTS AND INDUSTRIES

King County principal port lands extend up the Duwamish River a little over a mile and one-half from Seattle City Limits. An Industrial Development District, authorized by Legislation in 1951, in Seattle and King County is being developed by the Port of Seattle. Financial support of the District is achieved primarily through fees for facility or land leasing, tax levies, bonds, and a percentage of State tidelands lease money.

The right bank of the waterway is lined with large industries, some of which are neither shoreline dependent nor water oriented. The left bank is largely undeveloped flat land backed by a major thoroughfare, West Marginal Way South. Users of this land have little interaction with the water course, but are so located for access to the thoroughfare. A navigable channel one hundred feet wide is maintained to depths of nine to thirteen feet.

A wide variety of deep and shallow water oriented industries could be located along the Duwamish Waterway. These Industries may compete for the shoreline when the Duwamish River is adequately prepared for them. Examples are: Public and private terminal facilities, marine construction, boat builders, sand and gravel, etc.

Puget Sound will be impacted by changing bulk shipping technology. By 1980, 200,000 to 300,000 ton bulk carriers requiring channel depths from 60 to 90 feet will be standard. The unique deep water of Puget Sound will be attractive for the operation of these ships. Obviously, increasing pressure will be brought to bear for accommodation such as:

1. Off-shore facilities, floating docks, artificial islands, submerged pipes, barges and other mechanisms for loading and unloading ships.

2. Deep water piers or docks established along the coastline where no harbor exists.

Other industrial shoreline concentrations exist on streams, lakes and marine waters in King County. A number of these industries are not water oriented. The principal impacts upon the shoreline from port and industrial users are

APPENDIX C

Alternative Cost Estimates

Appendix C

ALTERNATIVE NO. 1
SWAMP CREEK ROUTE

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
Sawcutting	1800	LF	2.50	$4,500
Pavement Removal/Disposal	900	LF	12	$10,800
Temporary Road Install/Removal	4300	LF	50	$215,000
Dewatering	4667	LF	50	$233,350
Trench Box	4517	LF	10	$45,170
Excavation/Disposal	16000	CY	25	$400,000
Bedding Material	2400	CY	15	$36,000
Bedding Labor and Equipment	2400	CY	10	$24,000
36" Diameter Pipe	4667	LF	120	$560,040
Manholes (std)	15	EA	2,500	$37,500
Manholes (ext.)	85	LF	250	$21,250
Connect to Ext 36" Diameter	3	EA	20,000	$60,000
Connect to Ext 12" Diameter (max.)	5	EA	2,500	$12,500
Bore and Jack 60" Diameter	150	LF	750	$112,500
Bore and Jack Pits	2	EA	15,000	$30,000
Backfill Material	16000	CY	15	$240,000
Backfill Labor and Equipment	16000	CY	10	$160,000
Utility Relocation	1	LS	25,000	$25,000
Trench Patch	900	LF	10	$9,000
Pavement Overlay	2200	SY	12	$26,400
Native Restoration	10500	SY	1	$10,500
Traffic Control	1	LS	20,000	$20,000
MicroTunneling 36" Diameter	-		-	$0
MicroTunneling Pits				$0
				$2,293,510

Appendix C

ALTERNATIVE NO. 1
SWAMP CREEK ROUTE

Total Estimated Direct	$2,293,510
MicroTunnel Mob/Demob	$0
Project Mob/Demob (5%)	$114,676
Subtotal	$2,408,186
Subcontractor Markup (15% on 10% Project)	$36,123
Subtotal	$2,444,308
Contingency (15%)	$366,646
Subtotal	$2,810,955
Escalation to 1998 (4%)	$112,438
Subtotal	$2,923,393
Sales Tax (8.6%)	$251,412
Total Anticipated Construction Cost	$3,174,804
Allied Costs (35%)	$1,111,182
Property Acquisition	$357,500
Property Acquisition Contingency (45%)	$160,875
Total Anticipated Project Costs	**$4,804,361**
	$4.8 Million

Appendix C

ALTERNATIVE NO. 2
73rd AVE NE ROUTE

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
Sawcutting	5000	LF	2.50	$12,500
Pavement Removal/Disposal	2000	LF	12	$24,000
Temporary Road Install/Removal				$0
Dewatering	2000	LF	50	$100,000
Trench Box	1964	LF	10	$19,640
Excavation/Disposal	8926	CY	15	$133,890
Bedding Material	1100	CY	15	$16,500
Bedding Labor and Equipment	1100	CY	5	$5,500
36" Diameter Pipe	1964	LF	120	$235,680
Manholes (std)	10	EA	2,500	$25,000
Manholes (ext.)	120	LF	250	$30,000
Connect to Ext 36" Diameter	2	EA	20,000	$40,000
Connect to Ext 12" Diameter (max.)			-	$0
Bore and Jack 60" Diameter				$0
Bore and Jack Pits		-		$0
Backfill Material	9200	CY	15	$138,000
Backfill Labor and Equipment	9200	CY	8	$73,600
Utility Relocation	1	LS	25,000	$25,000
Trench Patch	2000	LF	10	$20,000
Pavement Overlay	5000	SY	12	$60,000
Native Restoration			-	$0
Traffic Control	1	LS	40,000	$40,000
MicroTunneling 36" Diameter	2431	LF	900	$2,187,900
MicroTunneling Pits	6	EA	50,000	$300,000
				$3,487,210

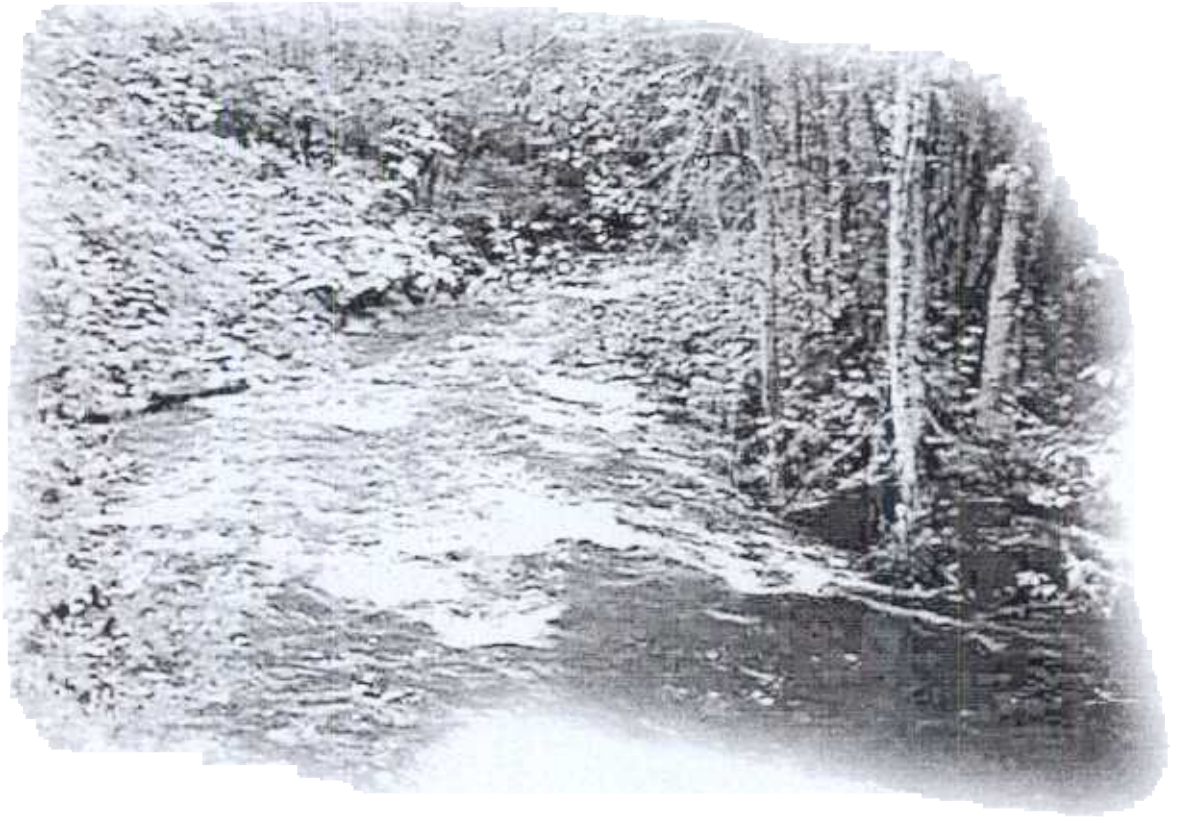
Appendix C

ALTERNATIVE NO. 2
73rd AVE NE ROUTE

Total Estimated Direct	$3,487,210
MicroTunnel Mob/Demob (5%)	$124,395
Project Mob/Demob (5%)	$180,580
Subtotal	$3,792,185
Subcontractor Markup (15% on 70% Project)	$398,179
Subtotal	$4,190,365
MicroTunneling Uncertainties (20% Microtunneling)	$497,580
Subtotal	$4,687,945
Contingency (15%)	$703,192
Subtotal	$5,391,136
Escalation to 1998 (4%)	$215,645
Subtotal	$5,606,782
Sales Tax (8.6%)	$482,183
Total Anticipated Construction Cost	$6,088,965
Allied Costs (35%)	$2,131,138
Property Acquisition	$12,500
Property Acquisition Contingency (45%)	$5,625
Total Anticipated Project Costs	**$8,238,228**
	$8.2 Million

APPENDIX D-1

Alternative Comparison - Fact Sheet



Appendix D-1

Alternative Comparison

Swamp Creek

Fact Sheet

Project Goals:	*Alternative 1 Swamp Creek*	*Alternative 2 73rd Avenue NE*
Meet short- and long-term service objectives	YES	YES
Meet Schedule	N/D	YES
Minimize long-term life cycle costs	YES	N/D
Minimize environmental impacts and permitting	NO	YES
Minimize construction risk	N/D	N/D

Engineering Design Issues:	*Alternative 1 Swamp Creek*	*Alternative 2 73rd Avenue NE*
Off Loads AWSD Flows From NUD Local Sewer	YES	YES
Replaces NUD Local Sewer	YES	NO

Engineering Construction Issues:	*Alternative 1 Swamp Creek*	*Alternative 2 73rd Avenue NE*
Pipe		
• Diameter	36 IN	36 IN
• Length	4,667 LF	4,395 LF
• Depth to Invert	10 - 20 FT	15 - 35 FT
Structures/Manholes	18 EA	12 EA
Construction Technique		
• Open-cut	4,517 LF	1.964 LF
• Trenchless or Jack and Bore	150 LF	2,431 LF
Creek Crossings	1 EA	1 EA
Dewatering	4,667LF	1,964 LF
Temporary Access Roadway	4,300LF	N/A
Offsite Disposal of Excavated Material	16,000 CY	9,000 CY
Imported Bedding & Backfill Material	16,000 CY	9,000 CY
Restoration		
• Roadway Length	900 LF	2,000 LF
• Unimproved Length	3,767 LF	N/A
Protection of Adjacent Structure	A	N/A

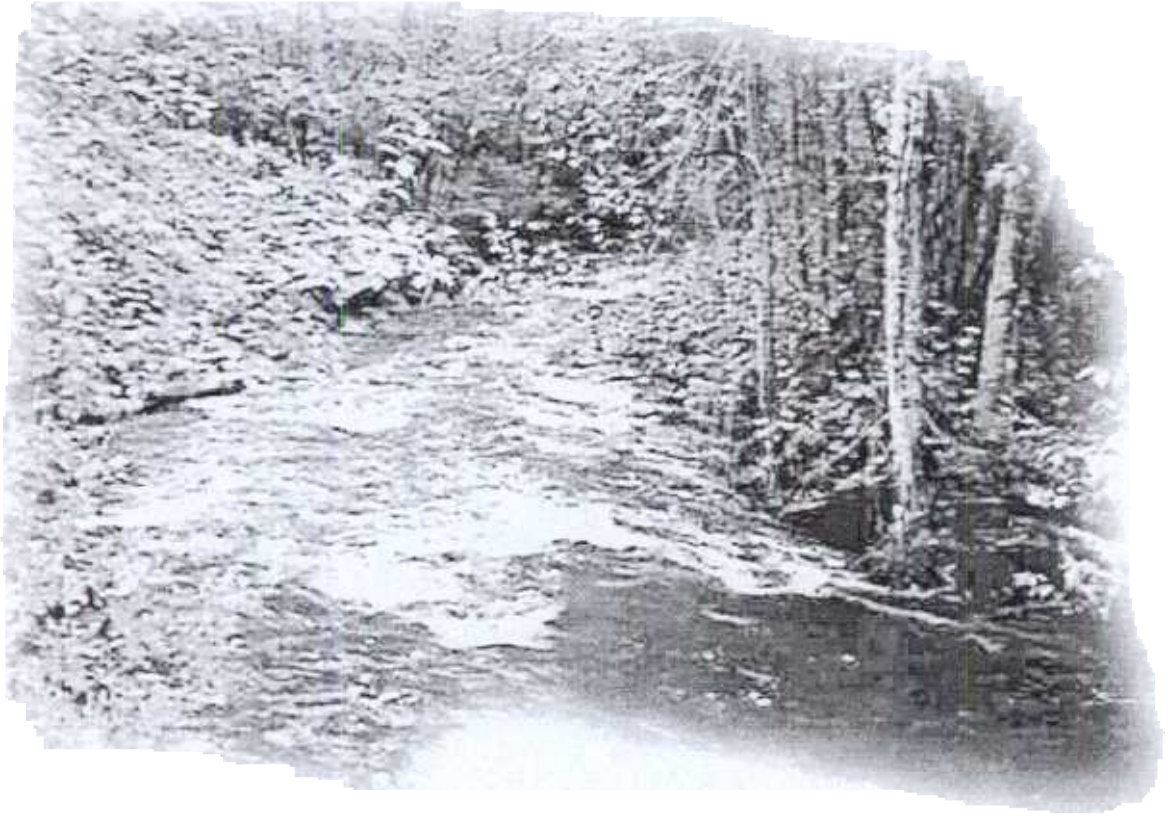
Geotechnical Issues:	*Alternative 1 Swamp Creek*	*Alternative 2 73rd Avenue NE*
Additional Geotechnical Services		
• Borings	5 EA (15-25 FT)	12 EA (20-60 FT)
• Test Pits	10 EA	N/A
• Grading Permit Requirement	A	N/A

Cost Issues:	*Alternative 1 Swamp Creek*	*Alternative 2 73rd Avenue NE*
Capital Cost		
• Construction Cost	$ 3.174.804	$ 6,088,965
• Allied Cost (35%)	1,111,182	2,131.138
• Property Acquisition (Easements)	518,375	18,125
• Total Project Cost*	$ 4,804,361	$ 8,238,228

* Some costs were revised subsequent to the preparation of the workshop fact sheet.

APPENDIX D-2

Alternative Comparison - Subjective Issues
(Blank Worksheet)



Appendix D-2

Alternative Comparison

Swamp Creek

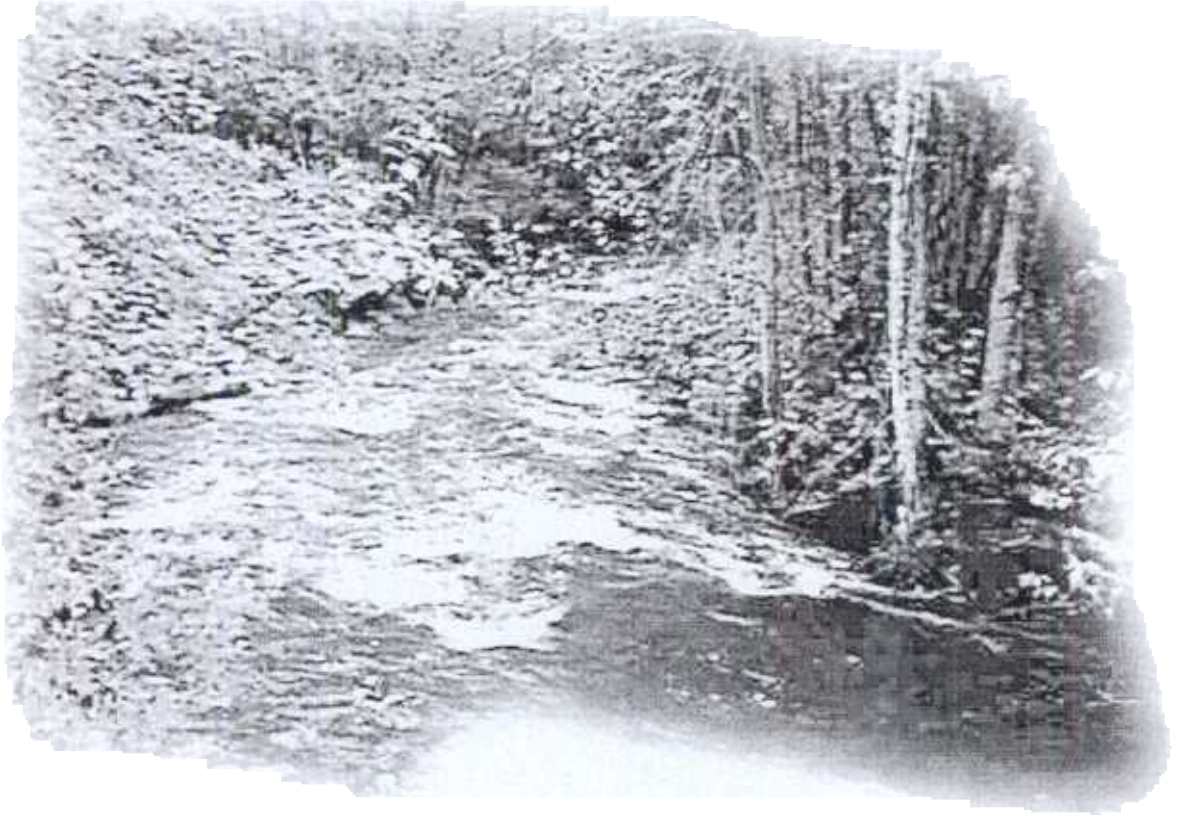
Subjective Issues

Project Goals:	*Alternative 1 Swamp Creek*	*Alternative 2 73rd Avenue NE*
Engineering Design Issues:	*Alternative 1 Swamp Creek*	*Alternative 2 73rd Avenue NE*
Engineering Construction Issues:	*Alternative 1 Swamp Creek*	*Alternative 2 73rd Avenue NE*
Compaction Requirements (Difficulty)		
Connection to Existing		
• End Connections (Complexity)		
• Local Sewers		
• Service Connections		
Utility Conflicts (Difficulty)		
Traffic Control/Detours (Complexity)		
Right-of-way/Easement Acquisition (Complexity)		

Geotechnical Issues:	***Alternative 1 Swamp Creek***	***Alternative 2 73rd Avenue NE***
Surficial Conditions		
General Subsurface Conditions		
• Soil (Difficulty)		
• Groundwater (Difficulty)		
Environmental/Permitting Issues:	***Alternative 1 Swamp Creek***	***Alternative 2 73rd Avenue NE***
Water		
• Surface Water/Wetland (Impacts)		
• Flooding and Flood Plain (Impacts)		
• Water Quality (Impacts)		
Plants and Animals (Impacts)		
Land Use (Impacts)		
Recreation (Impacts)		
Transportation (Impacts)		
Policies, Regulations, and Permits (Difficulty)		
Cost Issues:	***Alternative 1 Swamp Creek***	***Alternative 2 73rd Avenue NE***
Operation & Maintenance Cost		
• Access to Manholes (Difficulty)		
• Clearing and Brushing (Difficulty)		

APPENDIX D-3

Alternative Comparison - Subjective Issues (Completed Worksheet)



Appendix D-3

Draft Alternative Comparison - Swamp Creek

Subjective Issues

Project Goals:	***Alternative 1 Swamp Creek***	***Alternative 2 73rd Avenue NE***
See fact sheet		
Engineering Design Issues:	***Alternative 1 Swamp Creek***	***Alternative 2 73rd Avenue NE***
See fact sheet		
Engineering Construction Issues:	***Alternative 1 Swamp Creek***	***Alternative 2 73rd Avenue NE***
Compaction Requirements (Difficulty)	Moderate	High
Connection to Existing		
• End Connections (Complexity)	Low	High
• Local Sewers	Low	Low
• Service Connections	Low	Low
Utility Conflicts (Difficulty)	Low	High
Traffic Control/Detours (Complexity)	Low	High
Right-of-way/Easement Acquisition (Complexity)	High	Moderate
Geotechnical Issues:	***Alternative 1 Swamp Creek***	***Alternative 2 73rd Avenue NE***
Surficial Conditions	High	Moderate
General Subsurface Conditions		
• Soil (Difficulty)	High	Moderate
• Groundwater (Difficulty)	Very High	Moderate - High
Environmental/Permitting Issues:	***Alternative 1 Swamp Creek***	***Alternative 2 73rd Avenue NE***
Water		
• Surface Water/Wetland (Impacts)	Moderate - High	Low
• Flooding and Flood Plain (Impacts)	High	Low
• Water Quality (Impacts)	High	Low - Moderate
Plants and Animals (Impacts)	High	Low
Land Use (Impacts)	Moderate	Moderate
Recreation (Impacts)	Moderate - High	Low
Transportation (Impacts)	Low	High
Policies, Regulations, and Permits (Difficulty)	High	Moderate
Cost Issues:	***Alternative 1 Swamp Creek***	***Alternative 2 73rd Avenue NE***
Operation & Maintenance Cost		
• Access to Manholes (Difficulty)	High	Low
• Clearing and Brushing (Difficulty)	High	Low